Advancing Onsite
Non-potable Water Systems

Emerging Water Technology Symposium
May 15, 2018
Water is a Pressing Challenge
Managing Water Supplies is Not an Easy Task

Utilities are Working Hard to Diversify Supplies
Opportunity to Re-think & Re-imagine Water Use in Buildings
Buildings Produce Water

Precipitation collected from roofs and above-grade surfaces

Wastewater from toilets, dishwashers, kitchen sinks, and utility sinks

Wastewater from clothes washers, bathtubs, showers, and bathroom sinks

Precipitation collected at or below grade

Nuisance groundwater from dewatering operations
Up to 50% of Demands are Non-potable in Multi-family Residential Buildings

Source: adapted from Alliance for Water Efficiency
Up to 95% of Demands are Non-potable in Commercial Buildings

Office Water Use
- Sanitary
- Cooling Tower Make-up
- Irrigation
- Single-Pass Cooling
- Kitchen
- Miscellaneous

Source: USEPA
Rainwater Harvesting System
- 25,000 gallon cistern
- Reuse for irrigation

Wetland Treatment System
- Collects and treats building’s wastewater
- Reuse for toilet flushing
- 5,000 gpd capacity
Developers Interested in Collecting & Treating Water Onsite
# Overview of Roles and Responsibilities

<table>
<thead>
<tr>
<th>SFPUC</th>
<th>SFDPH</th>
<th>SFDBI</th>
<th>SFPW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program Administration and Cross-Connection Control</strong></td>
<td><strong>Public Health</strong></td>
<td><strong>Construction</strong></td>
<td><strong>Right of Way and Mapping</strong></td>
</tr>
<tr>
<td>Review onsite non-potable water supplies &amp; demands</td>
<td>Issue water quality &amp; monitoring requirements</td>
<td>Conduct Plumbing Plan check and issue Plumbing Permit</td>
<td>Issue Encroachment Permits as needed for infrastructure in the Right-of-Way (if needed)</td>
</tr>
<tr>
<td>Administer citywide project tracking &amp; annual potable offset achieved</td>
<td>Review and approve non-potable engineering report</td>
<td>Inspect and approve system installations</td>
<td>Includes condition on a subdivision map or a parcel map requiring compliance with the Non-potable Ordinance prior to approval and issuance of said map (if applicable)</td>
</tr>
<tr>
<td>Provide technical support &amp; outreach to developers</td>
<td>Issue permit to operate onsite systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manages Cross-Connection Control Program</td>
<td>Review water quality reporting</td>
<td></td>
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</tbody>
</table>
Key Requirements for Onsite Systems

- Water and Sewer Connections
- Backflow Protection Requirements
- Cross Connection Test Prior to Operation
- Operator Capacity
SFPUC Hydraulic Modeling

- SFPUC uses hydraulic modeling to evaluate how individual non-potable projects affect the discharge to the sewer in terms of flow volumes to sewer and odor.

- Key finding: most sewer main pipelines already experience very low flows, so NPO impacts are mostly negligible.
An Evolving Non-potable Water Program

2012
Single Building

2013
District-scale

2015
Mandatory for projects ≥ 250,000 sf

2016
Implementation Requirements for District-scale Systems
Hampton Inn
Rainwater for Toilet Flushing
38 Dolores Street
Rainwater for Irrigation
181 Fremont
Graywater for Toilet Flushing
Moscone Convention Center
Foundation Drainage for Flushing, Irrigation, and Street Sweeping
NRG-BART Project
Foundation Drainage for Downtown Steam Loop
Piloting Decentralized Purified Water
Collaborating on a National Level

Innovation in Urban Water Systems

San Francisco • May 2014
Need for Improved Public Health Guidance
Technical Guidance for Public Health Standards for Onsite Water Systems

- Current water quality standards are **not health risk based**

- Risk-based pathogen **Log Reduction Targets (LRTs)** were established using a methodology that estimates the potential health risk associated with exposure to **viruses, protozoa, and bacteria**

- Methodology is based on widely accepted practices for potable reuse and drinking water
## Log Reduction Targets

<table>
<thead>
<tr>
<th>Alternate Water Use Scenario</th>
<th>Enteric Viruses</th>
<th>Parasitic Protozoa</th>
<th>Enteric Bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackwater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor use</td>
<td>8.0</td>
<td>7.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Indoor use</td>
<td>8.5</td>
<td>7.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Graywater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor use</td>
<td>5.5</td>
<td>4.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Indoor use</td>
<td>6.0</td>
<td>4.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Rainwater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor use</td>
<td>N/A</td>
<td>N/A</td>
<td>3.5</td>
</tr>
<tr>
<td>Indoor use</td>
<td>N/A</td>
<td>N/A</td>
<td>3.5</td>
</tr>
<tr>
<td>Stormwater or Foundation Drainage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor use</td>
<td>3.0</td>
<td>2.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Indoor use</td>
<td>3.5</td>
<td>3.5</td>
<td>3.0</td>
</tr>
</tbody>
</table>
Blackwater Treatment Train
Validation, Field Verification, Ongoing Monitoring

![Diagram of treatment process]

**Tier 1 operating envelope parameters**
- UV transmittance
- Turbidity
- Flow rate
- UV Intensity
- pH
- Free chlorine residual

### Pathogen Crediting

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Total</th>
<th>Required</th>
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<tbody>
<tr>
<td>Virus</td>
<td>1.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Protozoa</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Bacteria</td>
<td>4</td>
<td>3.5</td>
</tr>
</tbody>
</table>

### Validation and Field Verification

<table>
<thead>
<tr>
<th>Validation and Field Verification</th>
<th>Total</th>
<th>Required</th>
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</thead>
<tbody>
<tr>
<td>Field verification of operation within Tier 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Validation for dose of 80 mJ/cm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tracer study or assumed baffling factor of 0.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Treatment System Requirements

<table>
<thead>
<tr>
<th>Treatment System Requirements</th>
<th>Total</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effluent turbidity &lt; 0.2 NTU; Operation within Tier 1; Effluent UVT &gt; minimum validated value for UV reactor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UV dose &gt; 80 mJ/cm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT of 450 mg-min/L 90-min T&lt;sub&gt;Modal&lt;/sub&gt;</td>
<td></td>
<td></td>
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</tbody>
</table>
Guidebook for Developing and Implementing Policies for ONWS

- Guidebook includes:
  - Model State Regulation
  - Model Local Ordinance
  - Program Rules to be implemented with the state regulation or local ordinance

- Intended to create nationally consistent treatment standards and management approaches from state-to-state
Recommended Strategy for California

- State establishes risk-based treatment standards and monitoring and reporting requirements for onsite systems
- Locals adopt ordinances and permit systems on the local level
- SB 966
In 2016, SFPUC and AWE won the Imagine H20 California Water Policy Challenge.

SFPUC led 3 stakeholder workshops in SAC, SF, and LA to gather feedback on a statewide policy to establish water quality standards, monitoring and reporting requirements for onsite non-potable water systems.

General support for the statewide policy was expressed.
Making the Utility Case for ONWS

- New report inspires One Water leaders to consider onsite water systems in their long-term water resource and resilience planning

- Helps water and wastewater utilities and others understand the benefits and drivers behind onsite non-potable reuse
Guidance Materials and Training

• Translate LRTs into effective design, operation and regulation
  • User-friendly materials
  • Applicable nation-wide
  • Available end of 2018
Thank You

sfwater.org/np